

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): An optical disc recording apparatus for generating a modulation signal having a signal level switched at a period which is an integral multiple of a basic period in accordance with main information and controlling an optical beam applied to an optical disc based on said modulation signal to successively form, on said optical disc, pits and lands or marks and spaces having lengths which are represented by integral multiples of a basic length corresponding to said basic period, wherein a sequence of data based on auxiliary information is modulated by a signal represented by a combination of a sequence of pseudo-random numbers and a predetermined periodic signal, and recorded traces of said pits or said marks are changed depending on the modulated sequence of data, thereby recording said auxiliary information on said optical disc, the optical disc recording apparatus comprising:

a first modulation signal generating unit configured to generate a first modulation signal having a signal level switched at a period which is an integral multiple of said basic period in accordance with said main information;

a second modulation signal generating unit configured to modulate said first modulation signal with a signal based on the sequence of data based on said auxiliary information;

a recording beam modulating unit configured to modulate said optical beam with a signal output from said second modulation signal generating unit; and

an optical system for applying said optical beam to said optical disc;

said second modulation signal generating unit comprising:

a pseudo-random number generating unit configured to generate a pseudo-random number;

a periodic signal generating unit configured to generate said predetermined periodic signal, said periodic signal generating unit including a counter configured to count channel clock pulses output from a phase lock loop circuit, the counter being cleared by a frame clock pulse output from a synchronous detecting circuit, the counter supplying the most significant bit of the counter value as a toggle signal to an exclusive-OR circuit;

an auxiliary information modulating unit configured to modulate the sequence of data based on said auxiliary information with a signal represented by a combination of the random number from said pseudo-random number generating unit and the predetermined periodic signal from said periodic signal generating unit; and

a modulation signal processing unit configured to modulate said first modulation signal to slightly change the recorded traces of said pits or said marks, based on the modulated sequence of data from said auxiliary information modulating unit.

Claim 2 (Canceled).

Claim 3 (Original): The optical disc recording apparatus according to claim 1, wherein said periodic signal comprises a signal inverted at a period which is at least twice said basic period.

Claim 4 (Canceled).

Claim 5 (Currently Amended): The optical disc recording apparatus according to claim 1 [[2]], wherein said periodic signal generating unit comprises a unit configured to combine for combining a plurality of signals inverted at a period which is at least twice said basic period to generate said periodic signal.

Claim 6 (Currently Amended): The optical disc recording apparatus according to claim 1 [[2]], wherein said pseudo-random number generating unit comprises a linear feedback shift register.

Claim 7 (Original): The optical disc recording apparatus according to claim 1, wherein said recorded traces of said pits or said marks are changed at a position corresponding to a period extending substantially equally over a time corresponding to the center of said pits or said marks.

Claim 8 (Original): The optical disc recording apparatus according to claim 1, wherein said sequence of data based on said auxiliary information comprises a sequence of identification data for identifying said optical disc.

Claim 9 (Original): The optical disc recording apparatus according to claim 1, wherein said main information is encrypted and recorded on said optical disc, and said sequence of data based on said auxiliary information comprises a sequence of data required to decrypt the encrypted main information.

Claim 10 (Original): The optical disc recording apparatus according to claim 1, wherein said recorded traces of said pits or said marks which have lengths equal to or greater than a predetermined length are changed by changing a width of said pits or said marks at a time which is spaced a predetermined interval from a time corresponding to an edge of said pits or said marks.

Claim 11 (Original): The optical disc recording apparatus according to claim 1, wherein said recorded traces of said pits or said marks are changed by displacing a position where said optical beam is applied to said optical disc in a radial direction of said optical disc, depending on the sequence of data based on said auxiliary information which is modulated by the signal represented by the combination of the sequence of pseudo-random numbers and the predetermined periodic signal.

Claim 12 (Original): The optical disc recording apparatus according to claim 1, wherein said recorded traces of said pits or said marks are changed by changing a length of said pits or said marks, depending on the sequence of data based on said auxiliary information which is modulated by the signal represented by the combination of the sequence of pseudo-random numbers and the predetermined periodic signal.

Claim 13 (Currently Amended): An optical disc recording apparatus for generating a modulation signal having a signal level switched at a period which is an integral multiple of a basic period in accordance with main information and controlling an optical beam applied to an optical disc based on said modulation signal to successively form, on said optical disc, pits and lands or marks and spaces having lengths which are represented by integral multiples of a basic length corresponding to said basic period, wherein a sequence of data based on auxiliary information is modulated by a signal represented by a combination of a sequence of pseudo-random numbers and a predetermined periodic signal, and the reflectance of an information recording surface of said optical disc is locally changed depending on the modulated sequence of data, thereby recording said auxiliary information on said optical disc, the optical disc recording apparatus comprising:

a first modulation signal generating unit configured to generate a first modulation signal having a signal level switched at a period which is an integral multiple of said basic period in accordance with said main information;

a second modulation signal generating unit configured to modulate said first modulation signal with a signal based on the sequence of data based on said auxiliary information;

a recording beam modulating unit configured to modulate said optical beam with a signal output from said second modulation signal generating unit; and

an optical system for applying said optical beam to said optical disc;

said second modulation signal generating unit comprising:

a pseudo-random number generating unit configured to generate a pseudo-random number;

a periodic signal generating unit configured to generate said predetermined periodic signal, said periodic signal generating unit including a counter configured to count channel clock pulses output from a phase lock loop circuit, the counter being cleared by a frame clock pulse output from a synchronous detecting circuit, the counter supplying the most significant bit of the counter value as a toggle signal to an exclusive-OR circuit;

an auxiliary information modulating unit configured to modulate the sequence of data based on said auxiliary information with a signal represented by a combination of the random number from said pseudo-random number generating unit and the predetermined periodic signal from said periodic signal generating unit; and

a modulation signal processing unit configured to modulate said first modulation signal to slightly change the recorded traces of said pits or said marks, based on the modulated sequence of data from said auxiliary information modulating unit.

Claim 14 (Currently Amended): A method of recording information on an optical disc by successively forming, on said optical disc, pits and lands or marks and spaces having lengths which are represented by integral multiples of a predetermined basic length to record main information on said optical disc, comprising ~~the steps of:~~

generating at least two pseudo-random numbers;

counting, with a counter, channel clock pulses output from a phase lock loop circuit, the counting being cleared by a frame clock pulse output from a synchronous detecting circuit, the counting step including supplying the most significant bit of the counter value as a toggle signal to an exclusive-OR circuit;

modulating a sequence of data based on auxiliary information with a signal represented by a combination of a sequence of said at least two pseudo-random numbers and a predetermined periodic signal; and

changing recorded traces of said pits or said marks depending on the modulated sequence of data, thereby recording said auxiliary information on said optical disc.

Claim 15 (Original): The method according to claim 14, wherein said recorded traces of said pits or said marks which have lengths equal to or greater than a predetermined length are changed by changing a width of said pits or said marks at a time which is spaced a predetermined interval from a time corresponding to an edge of said pits or said marks.

Claim 16 (Original): The method according to claim 14, wherein said recorded traces of said pits or said marks are changed by displacing a position where said optical beam is applied to said optical disc in a radial direction of said optical disc, depending on the sequence of data based on said auxiliary information which is modulated by the signal

represented by the combination of the sequence of pseudo-random numbers and the predetermined periodic signal.

Claim 17 (Original): The method according to claim 14, wherein said recorded traces of said pits or said marks are changed by changing a length of said pits or said marks, depending on the sequence of data based on said auxiliary information which is modulated by the signal represented by the combination of the sequence of pseudo-random numbers and the predetermined periodic signal.

Claim 18 (Currently Amended): A method of recording information on an optical disc by generating a modulation signal having a signal level switched at a period which is an integral multiple of a basic period in accordance with main information and controlling an optical beam applied to an optical disc based on said modulation signal to successively form, on said optical disc, pits and lands or marks and spaces having lengths which are represented by integral multiples of a basic length corresponding to said basic period, said method comprising the steps of:

generating at least two pseudo-random numbers;

counting, with a counter, channel clock pulses output from a phase lock loop circuit, the counting being cleared by a frame clock pulse output from a synchronous detecting circuit, the counting step including supplying the most significant bit of the counter value as a toggle signal to an exclusive-OR circuit;

modulating a sequence of data based on auxiliary information with a signal represented by a combination of a sequence of said at least two pseudo-random numbers and a predetermined periodic signal; and

locally changing the reflectance of an information recording surface of said optical disc depending on the modulated sequence of data, thereby recording said auxiliary information on said optical disc.

Claim 19 (Currently Amended): An optical disc having pits and lands or marks and spaces having lengths which are represented by integral multiples of a predetermined basic length, successively formed to record main information on said optical disc, wherein a sequence of data based on auxiliary information is modulated by a signal represented by a combination of a sequence of pseudo-random numbers and a predetermined periodic signal, and recorded traces of said pits or said marks are changed depending on the modulated sequence of data, thereby recording said auxiliary information on said optical disc, the optical disc recording apparatus comprising:

a first modulation signal generating unit configured to generate a first modulation signal having a signal level switched at a period which is an integral multiple of said basic period in accordance with said main information;

a second modulation signal generating unit configured to modulate said first modulation signal with a signal based on the sequence of data based on said auxiliary information;

a recording beam modulating unit configured to modulate said optical beam with a signal output from said second modulation signal generating unit; and

an optical system for applying said optical beam to said optical disc;

said second modulation signal generating unit comprising:

a pseudo-random number generating unit configured to generate a pseudo-random number;



a periodic signal generating unit configured to generate said predetermined periodic signal, said periodic signal generating unit including a counter configured to count channel clock pulses output from a phase lock loop circuit, the counter being cleared by a frame clock pulse output from a synchronous detecting circuit, the counter supplying the most significant bit of the counter value as a toggle signal to an exclusive-OR circuit;

an auxiliary information modulating unit configured to modulate the sequence of data based on said auxiliary information with a signal represented by a combination of the random number from said pseudo-random number generating unit and the predetermined periodic signal from said periodic signal generating unit; and

a modulation signal processing unit configured to modulate said first modulation signal to slightly change the recorded traces of said pits or said marks, based on the modulated sequence of data from said auxiliary information modulating unit.

Claim 20 (Original): The optical disc according to claim 19, wherein said recorded traces of said pits or said marks which have lengths equal to or greater than a predetermined length are changed by changing a width of said pits or said marks at a time which is spaced a predetermined interval from a time corresponding to an edge of said pits or said marks.

Claim 21 (Original): The optical disc according to claim 20, wherein said recorded traces of said pits or said marks are changed at a position corresponding to a period extending substantially equally over a time corresponding to the center of said pits or said marks.

Claim 22 (Original): The optical disc according to claim 20, wherein the width of said pits or said marks is changed depending on the modulated sequence of data by at most 10% of an average width of said pits or said marks.

Claim 23 (Original): The optical disc according to claim 19, wherein the sequence of data based on said auxiliary information comprises a sequence of identification data for identifying said optical disc.

Claim 24 (Original): The optical disc according to claim 19, wherein said main information is encrypted and recorded on said optical disc, and said sequence of data based on said auxiliary information comprises a sequence of data required to decrypt the encrypted main information.

Claim 25 (Original): The optical disc according to claim 19, wherein said pits or said marks have a position displaced in a radial direction of said optical disc depending on the sequence of data based on said auxiliary information which is modulated by the signal represented by the combination of the sequence of pseudo-random numbers and the predetermined periodic signal.

Claim 26 (Original): The optical disc according to claim 19, wherein said pits or said marks have a length displaced depending on the sequence of data based on said auxiliary information which is modulated by the signal represented by the combination of the sequence of pseudo-random numbers and the predetermined periodic signal.

Claim 27 (Currently Amended): An optical disc having pits and lands or marks and spaces having lengths which are represented by integral multiples of a predetermined basic length, successively formed to record main information on said optical disc, wherein a sequence of data based on auxiliary information is modulated by a signal represented by a

combination of a sequence of pseudo-random numbers and a predetermined periodic signal, and the reflectance of an information recording surface of said optical disc is locally changed depending on the modulated sequence of data, thereby recording said auxiliary information on said optical disc, the optical disc recording apparatus comprising:

a first modulation signal generating unit configured to generate a first modulation signal having a signal level switched at a period which is an integral multiple of said basic period in accordance with said main information;

a second modulation signal generating unit configured to modulate said first modulation signal with a signal based on the sequence of data based on said auxiliary information;

a recording beam modulating unit configured to modulate said optical beam with a signal output from said second modulation signal generating unit; and

an optical system for applying said optical beam to said optical disc;

said second modulation signal generating unit comprising:

a pseudo-random number generating unit configured to generate a pseudo-random number;

a periodic signal generating unit configured to generate said predetermined periodic signal, said periodic signal generating unit including a counter configured to count channel clock pulses output from a phase lock loop circuit, the counter being cleared by a frame clock pulse output from a synchronous detecting circuit, the counter supplying the most significant bit of the counter value as a toggle signal to an exclusive-OR circuit;

an auxiliary information modulating unit configured to modulate the sequence of data based on said auxiliary information with a signal represented by a combination of the random number from said pseudo-random number generating unit and the predetermined periodic signal from said periodic signal generating unit; and

a modulation signal processing unit configured to modulate said first modulation signal to slightly change the recorded traces of said pits or said marks, based on the modulated sequence of data from said auxiliary information modulating unit.

Claims 28-35 (Canceled).